

# PATENT ABSTRACTS OF JAPAN

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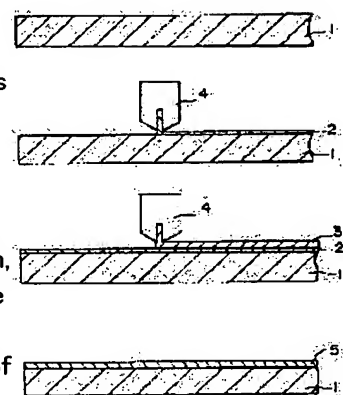
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## (54) MANUFACTURE OF PRINTED-WIRING BOARD

### (57)Abstract:

**PURPOSE:** To eliminate entertainment of bubbles at the time of application of an insulating resin film on a printed-wiring board to make it possible to obtain the flatness of the resin film by a method wherein before a low-solid content concentration liquid covered by a flow-out system is dried, a high-solid content concentration liquid is applied by the flow-out system to provide the resin film.

**CONSTITUTION:** A low-solid content concentration liquid 2 is applied on a board 1 by a flow-out system in a process for coating and drying an insulating resin solution, then, after a high-solid content concentration liquid 3 is applied by the flow-out system, the liquids 2 and 3 are dried, whereby a resin film 5 is provided. Thereby, even in the case where there is a recess part in the surface of the board 1 due to the spread wetting of the liquid 2, the air in the recess part is substituted for a fluid and the wettability with the high-solid content concentration liquid 3 is improved. Moreover, as the dilute solvent volatile content of the base low-solid content concentration liquid layer 2 is diffused in the upper high-solid content concentration liquid layer 3 at the time of the drying of the liquid 2, the levelling property of the high-solid content concentration liquid layer 3 is improved. As a result, regardless of the irregularities of the surface of the board 1, the formation of a flat film becomes possible on the surface of the board 1.



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**CLAIMS**

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[Claim(s)]

[Claim 1] The manufacture approach of a printed wired board of carrying out preparing the resin film by drying after it begins to pour the liquid of low solid-content concentration, and it carries out formula spreading of said insulating resin liquid on a substrate at a spreading desiccation process in the manufacture approach of the printed wired board which consists of resin film which made carrying out spreading desiccation and prepared insulating resin liquid on the substrate, and the liquid of said low solid-content concentration begins to pour the liquid of high solid-content concentration in the condition before a bone dry and subsequently carries out formula spreading as the description.

[Claim 2] said printed wired board -- an insulating layer and a conductor -- the manufacture approach of the printed wired board according to claim 1 characterized by for said substrate forming a conductor layer in both sides or one side of an electric insulating plate, and carrying out spreading desiccation of the insulating resin liquid, forming the resin film on it in a top, considering as an insulating layer, and galvanizing by consisting of a circuitry layer and patternizing appropriate after resin \*\*\*\*.

[Claim 3] said printed wired board -- an insulating layer and a conductor -- the manufacture approach of the printed wired board according to claim 1 characterized by consisting of a circuitry layer and said substrate forming a conductor layer and a plating layer in both sides or one side of an electric insulating plate by turns, patternizing the resin film after carrying out spreading desiccation of the insulating resin liquid on it, and performing appropriate back plating.

[Claim 4] claims 1, 2, and 3 characterized by said insulating resin liquid being photopolymer liquid -- the manufacture approach of a printed wired board given in any they are.

[Claim 5] claims 1, 2, 3, and 4 which begin to pass and are characterized by said thing [ that formula spreading is a slot coat ] -- the manufacture approach of a printed wired board given in any they are.

[Claim 6] claims 1, 2, 3, and 4 which begin to pass and are characterized by said thing [ that formula spreading is a curtain coat ] -- the manufacture approach of a printed wired board given in any they are.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] this invention -- an insulating layer and a conductor -- it is related with the manufacture approach of the printed wired board which prepares a circuitry layer, especially the multilayer printed wiring board formed by carrying out a laminating by turns.

[0002]

[Description of the Prior Art] The electronic equipment by which high-speed operation is called for has come to be widely used so that it may be represented by communication equipment in recent years.

[0003] although it is needless to say that high-speed operation is called for as for high-speed propagation of a signal being required, exact switching is possible to the signal of a high frequency -- etc. -- the variety demand is included. Since it corresponds to such electronic equipment, the printed wired board suitable for high-speed actuation is called for. In order to perform high-speed actuation, it is required to shorten the time amount which shortens the die length of wiring and propagation of an electrical signal takes. In order to shorten the die length of wiring, it is required that width of face of wiring should be shortened, spacing of wiring should be made small, and high density wiring should be performed.

[0004] The technique with which the printed wired board in consideration of the above high density, high-degree-of-accuracy wiring, and electrical characteristics is demanded of carrying an unit or two or more semiconductor chips directly on a printed wired board, carrying out direct continuation of the semiconductor chip to a printed wired board as a typical example using wirebonding and a pewter bump, and performing and carrying out the modularization of the resin seal etc. is mentioned. For example, it is a multi chip module (MCM).

[0005] Moreover, in order to enable high density wiring, it is required in a high precision to form wiring so that a printed wired board may be multilayered or spacing of wiring may be maintained. Moreover, in order that the width of face of wiring and thickness may affect the characteristic impedance of a printed wired board etc. and may influence an electrical property, highly precise wiring is called for also from the point. Furthermore, since insulating layer thickness also affects a characteristic impedance, exact control is required.

[0006] the demand of such high density wiring -- receiving -- JP,4-148590,A -- an insulating layer and a conductor -- the multilayer printed wiring board formed by carrying out the laminating of the circuitry layer by turns and its manufacture approach are indicated. namely, an electric insulating plate top -- a voltage plane, a grand layer, or a conductor -- a circuitry layer -- forming -- a it top -- an insulating layer -- forming -- further -- a it top -- a conductor -- a multilayer printed wiring board is formed by repeating the process of forming a circuitry layer and forming an insulating layer further an up-and-down conductor -- the flow between circuitry layers is connected in the Bahia hall. The SURUHORU consistency was stopped by this proposal, the degree of freedom of a wiring design improved, and high density wiring became easy.

[0007] In case an insulating layer is formed as shown in the example of the official report of JP,4-148590,A, photosensitive insulation resin liquid is applied using curtain coater. Moreover, in JP,4-103196,A, photosensitive polyimide is applied using a spin coater.

[0008] Generally, a roll coater, a spin coater, a spray coater, screen-stencil, curtain coater, slot (die) coater, etc. are known as a coater which applies the above-mentioned photosensitive insulation resin liquid on a substrate. However, since a roll coater has many thickness controlling factors, screen-stencil has the problem of being easy to generate a pinhole that a chip, a spin coater, and a spray coater have the narrow applicability of coating liquid, and the utilization ratio of coating liquid is low at repeatability and stability, and moreover tends to involve Ayr in them in a paint film from a spreading principle.

[0009]

[Problem(s) to be Solved by the Invention] Moreover, since it is what is performed without applying shear to the fluid with which curtain coater, slot (die) coater, etc. begin to pass, and spreading of a formula has the spreading principle between a substrate and a spreading head comparatively, This coater is used., the liquid of high solid content concentration, for example, the solid content concentration, of the above-mentioned fluid, from 40% to 80% Viscosity the liquid of 450 to 5,000CPS on a front face [ detailed ] For example, when applying on the substrate with which height has 18 to 35 micrometers and width of face has the irregularity of 100 micrometers or less, the air in the crevice on this substrate is not permuted by the fluid, but it has the problem of starting the contamination of air bubbles as a result.

[0010] Moreover, when applying fluids, such as a liquid hardened by the exposure of heat besides a solvent evaporation dry-sand-mould liquid like photosensitive insulation resin liquid, light, an electron ray, etc., on the substrate which has irregularity on a front face, in order the paint film of this fluid contracts at the time of hardening and to cause film decrease, it is difficult for the paint film gestalt after desiccation to serve as the form follow the irregularity on this front face of a substrate, and to form a flat paint film on this substrate front face as a result.

[0011] the reflow process at the time of mounting a subsequent heating process, for example, a semiconductor package and a chip, if air bubbles exist in an insulating layer when the property of a printed wired board is taken into consideration etc. -- setting -- that a crack occurs with rapid heating \*\*\*\* -- an insulating layer and a conductor -- exfoliation between circuitry layers occurs, and it becomes impossible to achieve the function as an insulating layer, and leads to dependability lowering. Moreover, if an exact precision of thickness is not acquired, the problem that it becomes impossible that it is hard to take adjustment of a characteristic impedance will also be generated.

[0012]

[Objects of the Invention] the object of this invention -- an insulating layer and a conductor -- the printed wired board which consists of a circuitry layer especially an insulating layer, and a conductor -- in the manufacture approach of the multilayer printed wiring board formed by carrying out the laminating of the circuitry layer by turns, the technical problem that neither the contamination of the air bubbles at the time of applying insulating resin liquid, such as photosensitivity, nor the surface smoothness after hardening is obtained is solved, and it is reliable, and it is offering the manufacture approach of a printed wired board of being easy to take adjustment of a characteristic impedance.

[0013]

[Means for Solving the Problem] In the manufacture approach of the printed wired board which consists of resin film which was made to carry out spreading desiccation and prepared insulating resin liquid on the substrate in claim 1 in order to solve the above-mentioned technical problem said insulating resin liquid at a spreading desiccation process The manufacture approach of the printed wired board characterized by preparing the resin film by drying after it begins to pour the liquid of low solid content concentration, and it carries out formula spreading on a substrate, and the liquid of said low solid content concentration begins to pour the liquid of high solid content concentration in the condition before a bone dry and subsequently carries out formula spreading is offered.

[0014] moreover -- claim 2 -- said printed wired board -- an insulating layer and a conductor -- it consists of a circuitry layer and the manufacture approach of the printed wired board according to claim 1 characterized by forming a conductor layer in both sides or one side of an electric insulating plate, for said substrate carrying out spreading desiccation of the insulating resin liquid, forming the resin film on it in a top, considering as an insulating layer, and galvanizing by patternizing appropriate after resin \*\*\*\* is offered.

[0015] moreover -- claim 3 -- said printed wired board -- an insulating layer and a conductor -- it consists of a circuitry layer and said substrate forms a conductor layer and a plating layer in both sides or one side of an electric insulating plate by turns, after carrying out spreading desiccation of the

insulating resin liquid on it, the resin film is patternized, and the manufacture approach of the printed wired board according to claim 1 characterized by performing appropriate back plating is offered.

[0016] moreover, claims 1, 2, and 3 characterized by said insulating resin liquid being photopolymer liquid in claim 4 -- the manufacture approach of a printed wired board given in any they are is offered.

[0017] moreover, claims 1, 2, 3, and 4 which begin to pass and are characterized by said thing [ that formula spreading is a slot coat ] in claim 5 -- the manufacture approach of a printed wired board given in any they are is offered.

[0018] moreover, claims 1, 2, 3, and 4 which begin to pass and are characterized by said thing [ that formula spreading is a curtain coat ] in claim 6 -- the manufacture approach of a printed wired board given in any they are is offered. The claim 1 publication which begins to pass and is characterized by said thing [ that formula spreading is a curtain coat ], or the manufacture approach of a printed wired board according to claim 2 is offered.

[0019] Especially as a liquid of the low solid content concentration of a fluid, the dilution solvent of the liquid of 10% or less or high solid content concentration has good solid content concentration. As a liquid of high solid content concentration, solid content concentration has [ viscosity ] the desirable liquid of 450 to 5,000CPS 40% to 80%.

[0020] moreover -- as the liquid of the low solid content concentration of a fluid -- the dilution solvent of the liquid of high solid content concentration -- it is desirable.

[0021]

[Function] According to this invention, even when a crevice is shown in a substrate front face by the extended wetting of the liquid of this low solid content concentration, the air in a crevice is permuted by this fluid. Because the wettability over the liquid of high solid content concentration improves and the dilution solvent volatile matter of the low solid content concentration liquid of a substrate spreads and goes to the layer of the upper high solid content concentration liquid further at the time of desiccation The leveling nature of this high solid content concentration liquid layer is raised, and flat paint film formation is attained regardless of the irregularity on this front face of a substrate as a result.

[0022]

[Example] The method of application of this invention is explained to a detail according to one example of drawing 1 - drawing 3 . Drawing 1 and drawing 2 show the process of the method of application in this invention. Drawing 3 shows drawing used for the rate calculation approach of flattening of a paint film. The rate of flattening is taken out with a formula called rate (%) of flattening  $= (\text{thickness } b / (\text{thickness } a + \text{thickness } c) / 2) \times 100$  based on the value of a, b, and c which were obtained by drawing 3 .

[0023] Slot (die) coater, curtain coater, etc. are mentioned as a coater with which this invention is applied. In the case of this example, slot (die) coater was used.

[0024] a substrate -- for example, height -- 18 to 35 micrometers, and width of face -- a conductor 100 micrometers or less -- although it is the substrate which has the irregularity formed of the circuitry layer, it is not restricted to this.

[0025] First, it is a low solid content concentration liquid (solid-content concentration: 10% or less) on the substrate ( drawing 11 ) front face which gave cleaning, acid cleaning, backwashing by water, etc. Viscosity: 20cps or less is applied ( drawing 1 R> 1-2), apply a high solid content concentration liquid (solid-content concentration: 40% - 80%, viscosity:450-5,000cps) in the condition that it subsequently is not thoroughly dry ( drawing 13 ), dry at the end, and form a paint film ( drawing 14 ).

[0026] <an example 1> -- the front face which gave cleaning, acid cleaning, backwashing by water, etc. - - a conductor -- on the substrate in which the circuitry layer was formed, the low solid content concentration liquid was applied first, it is in the condition that it subsequently is not thoroughly dry, and the high solid content concentration liquid was applied. A monograph affair is shown below.

[0027]

[Charge of material ] Seed Exception: Solder resist Solid content: High solid content concentration .... 80% (viscosity: 5000CPS)

Low solid content concentration .... 0%, the dilution solvent (cyclohexanone: methyl-cellosolve =1:3) of a high solid content concentration liquid was used for the low solid content concentration liquid.

[Radical plate] Seed Exception: Substrate for printed circuits Size: 340x340x0.6mm thickness [Spreading condition] bearer rate: 0.6 – 1.2 m/min A spreading head / distance between substrates: 100–300 micrometers Discharge pressure: 0.1–3.0kg/cm<sup>2</sup> Spreading head slit width: 30–300 micrometers [Desiccation condition] drying temperature: 80 degrees C Drying time: 30min, consequently a paint film without the contamination of air bubbles were able to be obtained. The rate of flattening at this time was –93%.

[0028] <Example 2> The low solid content concentration liquid was first applied on the substrate which has irregularity on the front face which gave cleaning, acid cleaning, backwashing by water, etc., and high solid content concentration liquid spreading was carried out in the condition that it subsequently is not thoroughly dry. A monograph affair is shown below.

[0029]

[Charge of material ] Seed Exception: Solder resist Solid content: High solid content concentration .... 80% (viscosity: 5000CPS)

Low solid content concentration .... 10% (viscosity: 10CPS)

What diluted the high solid content concentration liquid with the solvent (cyclohexanone: methyl-cellosolve =1:3) was used for the low solid content concentration liquid.

[Radical plate] Seed Exception: Substrate for printed circuits Size: 340x340x0.6mm thickness [Spreading condition] bearer rate: 0.6 – 1.2 m/min A spreading head / distance between substrates: 100–300 micrometers Discharge pressure: 0.1–3.0kg/cm<sup>2</sup> Spreading head slit width: 30–300 micrometers [Desiccation condition] drying temperature: 80 degrees C Drying time: 30min, consequently a paint film without the contamination of air bubbles were able to be obtained. The rate of flattening at this time was –96%.

[0030] <Example 1 of a comparison> By the conventional approach, it applied on condition that the following.

[Charge of material ] Seed Exception: Solder resist Solid-content concentration: 80% (viscosity: 5000CPS)

[Radical plate] Seed Exception : [ The substrate for printed circuits ] Size: 340x340x0.6mm thickness [Spreading condition] bearer rate : [ 0.6 – 1.2 m/min ] Spreading head height : 100–300 micrometers Discharge pressure : 1.0–3.0kg/cm<sup>2</sup> spreading head slit width: 200–300 micrometers [Desiccation condition] drying temperature: 80 degrees C Drying time: The contamination of air bubbles was accepted in the concavo-convex circles on the front face of a substrate by 30min, consequently cross-section observation.

[0031]

[Effect of the Invention] Since the liquid of low solid content concentration is applied first and the liquid of high solid content concentration was applied subsequently to before a bone dry like the above according to the method of application of this invention, a flat paint film can be formed without, for example, involving in air bubbles on the substrate front face which has irregularity.

[0032]

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing one example of the method of application of this invention.

[Drawing 2] It is the expanded sectional view of the substrate surface minute irregularity section showing one example of the method of application of this invention.

[Drawing 3] It is drawing showing the value of a, b, and c which becomes the origin of the calculation approach of the rate of flattening.

[Description of Notations]

1 .... Radical Plate

2 .... Low Solid Content Concentration Liquid

3 .... High Solid Content Concentration Liquid

4 .... Coater Head

5 .... Paint Film

6 .... Conductor -- Circuitry Layer

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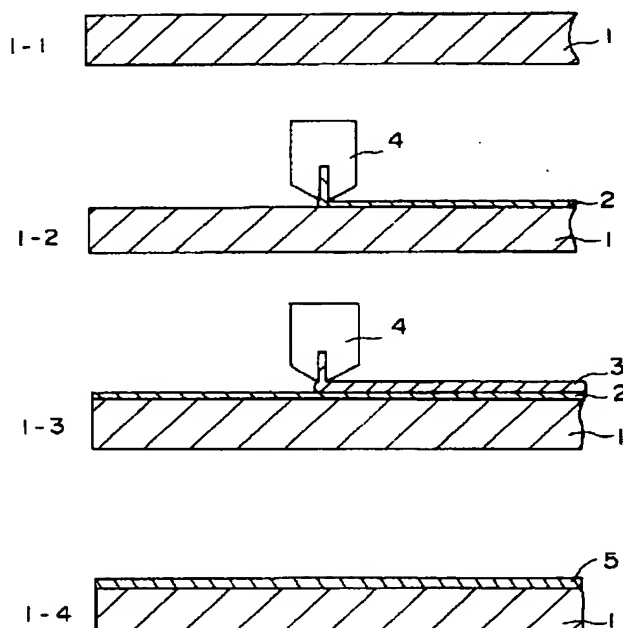
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## (54) 【発明の名称】 プリント配線板の製造方法

## (57) 【要約】

【構成】絶縁層と導体回路層からなるプリント配線板の製造方法において、前記絶縁層が絶縁板の両面あるいは片面に導体層を形成し、その上に絶縁樹脂液を塗布乾燥させて設けた樹脂膜からなり、前記絶縁樹脂液を塗布乾燥工程で、基板上に低固形分濃度の液体を流し出し式塗布し、次いで前記低固形分濃度の液体が完全乾燥前の状態にて高固形分濃度の液体を流し出し式塗布したのち乾燥する。

【効果】低固形分濃度の液体を塗布し、次いで完全乾燥前に高固形分濃度の液体を塗布するようにしたので、たとえば、凹凸を有する基板表面上に気泡を巻き込むことなく平坦な塗膜を形成することが出来る。





(2)

## 【特許請求の範囲】

【請求項1】基板上に絶縁樹脂液を塗布乾燥させて設けた樹脂膜からなるプリント配線板の製造方法において、前記絶縁樹脂液を塗布乾燥工程で、基板上に低固形分濃度の液体を流し出し式塗布し、次いで前記低固形分濃度の液体が完全乾燥前の状態にて高固形分濃度の液体を流し出し式塗布したのち乾燥することで樹脂膜を設けることを特徴とするプリント配線板の製造方法。

【請求項2】前記プリント配線板が絶縁層と導体回路層からなるものであり、前記基板が絶縁板の両面あるいは片面に導体層を形成したものであり、その上に絶縁樹脂液を塗布乾燥させて上で樹脂膜を形成して絶縁層とし、しかるのち樹脂膜ををパターン化しめっきを施すことを特徴とする請求項1記載のプリント配線板の製造方法。

【請求項3】前記プリント配線板が絶縁層と導体回路層からなるものであり、前記基板が絶縁板の両面あるいは片面に導体層とめっき層を交互に形成したものであり、その上に絶縁樹脂液を塗布乾燥させた上で樹脂膜をパターン化し、しかるのちめっきを施すことを特徴とする請求項1記載のプリント配線板の製造方法。

【請求項4】前記絶縁樹脂液が感光性樹脂液であることを特徴とする請求項1、2、3何れかに記載のプリント配線板の製造方法。

【請求項5】前記流し出し式塗布がスロットコートであることを特徴とする請求項1、2、3、4何れかに記載のプリント配線板の製造方法。

【請求項6】前記流し出し式塗布がカーテンコートであることを特徴とする請求項1、2、3、4何れかに記載のプリント配線板の製造方法。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は絶縁層と導体回路層を設けるプリント配線板、特に交互に積層して形成される多層プリント配線板の製造方法に関する。

## 【0002】

【従来の技術】近年、通信機器に代表されるように、高速動作が求められる電子機器が広く使用されるようになってきた。

【0003】高速動作が求められるということは、信号の高速な伝搬が要求されることはもちろんであるが、高い周波数の信号に対し、正確なスイッチングが可能であるなど多種な要求を含んでいる。そのような電子機器に対応するため、高速な動作に適したプリント配線板が求められている。高速な動作を行うためには、配線の長さを短くし、電気信号の伝搬に要する時間を短縮することが必要である。配線の長さを短縮するために、配線の幅を短くし、配線の間隔を小さくして高密度配線を行うことが要求されている。

【0004】以上のような高密度、高精度配線、電気的特性を考慮したプリント配線板が要求されている代表的

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な例として、プリント配線板上に単数もしくは複数の半導体チップを直接搭載し、ワイヤボンディング、ハンダバンプを用いて、プリント配線板と半導体チップを直接接続し、樹脂封止等を行ってモジュール化するという技術が挙げられる。例えば、マルチチップモジュール(MCM)である。

【0005】また、高密度配線を可能にするためには、プリント配線板を多層化したり、配線の間隔が保たれるよう、高い精度で配線が形成されていることが必要である。また、配線の幅、厚さはプリント配線板の特性インピーダンス等に影響を与え、電気特性を左右するため、その点からも高精度な配線が求められている。さらに、絶縁層の厚さも特性インピーダンスには影響を与えるため、正確な制御が必要である。

【0006】そのような高密度配線の要求に対し、特開平4-148590では、絶縁層と導体回路層を交互に積層して形成される多層プリント配線板ならびにその製造方法が開示されている。すなわち、絶縁板上に電源層あるいはグランド層、または導体回路層を形成し、その上に絶縁層を形成し、さらにその上に導体回路層を形成し、さらに絶縁層を形成するという工程を繰り返すことにより多層プリント配線板を形成するというものである。上下の導体回路層間の導通はパイアホールで接続される。この提案により、スルホール密度が抑えられ、配線設計の自由度が向上し、高密度配線が容易になった。

【0007】特開平4-148590の公報の実施例に示されているように絶縁層を形成する際、感光性絶縁樹脂液をカーテンコータを用いて塗布している。また特開平4-103196では感光性ポリイミドをスピンコータを用いて塗布している。

【0008】一般的に、上記感光性絶縁樹脂液を基板上に塗布する塗布装置として、ロールコータ、スピンコータ、スプレーコータ、スクリーン印刷、カーテンコータ、スロット(ダイ)コータなどが知られている。しかしながら、ロールコータは膜厚制御因子が多いために再現性、安定性に欠け、スピンコータ、スプレーコータは塗布液の適用範囲が狭くしかも塗布液の使用効率が低く、スクリーン印刷は塗布原理から塗膜内にエアーを巻き込み易くピンホールが発生し易い、などの問題がある。

## 【0009】

【発明が解決しようとする課題】また、カーテンコータやスロット(ダイ)コータ等の流し出し式の塗布はその塗布原理が基板と塗布ヘッドとの間にある流体に比較的せん断をかけずに行うものであるため、該塗布装置を用いて上記流体の高固形分濃度の液体、例えば、固形分濃度が40%から80%、粘度が450から5,000CPSの液体を、表面に微細な、例えば、高さが18から35 $\mu$ m、幅が100 $\mu$ m以下の、凹凸を有する基板上に塗布する場合、該基板上の凹部内の空気が流体に置換

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されず、結果として気泡の巻き込みを起こすという問題を抱えている。

【0010】また、表面に凹凸を有する基板上に、感光性絶縁樹脂液のような溶剤蒸発乾燥型液体のほか熱や光や電子線などの照射により硬化する液体などの流体を塗布する場合、該流体の塗膜が硬化時に収縮し膜減りを起こすため、乾燥後の塗膜形態は該基板表面の凹凸に追従する形となり、結果として該基板表面上に平坦な塗膜を形成することが困難である。

【0011】プリント配線板の特性を考慮した場合、絶縁層内に気泡が存在すると、その後の加熱工程、たとえば、半導体パッケージやチップ部品を実装する際のリフロー工程等において、急激な加熱によりクラックが発生したり、絶縁層と導体回路層間の剥離が発生したりして、絶縁層としての機能が果たせなくなり信頼性低下につながる。また、膜厚の正確な精度が得られないと、特性インピーダンスの整合がとれにくくなるといった問題も発生する。

【0012】

【発明の目的】本発明の目的は、絶縁層と導体回路層からなるプリント配線板、特に絶縁層と導体回路層を交互に積層して形成される多層プリント配線板の製造方法において、感光性等の絶縁樹脂液を塗布する際の気泡の巻き込みや硬化後の平坦性が得られないといった課題を解決し、信頼性が高く、また、特性インピーダンスの整合をとりやすいプリント配線板の製造方法を提供することである。

【0013】

【課題を解決するための手段】上記課題を解決するために、請求項1では基板上に絶縁樹脂液を塗布乾燥させて設けた樹脂膜からなるプリント配線板の製造方法において、前記絶縁樹脂液を塗布乾燥工程で、基板上に低固形分濃度の液体を流し出し式塗布し、次いで前記低固形分濃度の液体が完全乾燥前の状態にて高固形分濃度の液体を流し出し式塗布したのち乾燥することで樹脂膜を設けることを特徴とするプリント配線板の製造方法を提供するものである。

【0014】また、請求項2では、前記プリント配線板が絶縁層と導体回路層からなるものであり、前記基板が絶縁板の両面あるいは片面に導体層を形成したものであり、その上に絶縁樹脂液を塗布乾燥させて上で樹脂膜を形成して絶縁層とし、しかるのち樹脂膜をパターン化しめっきを施すことを特徴とする請求項1記載のプリント配線板の製造方法を提供するものである。

【0015】また、請求項3では、前記プリント配線板が絶縁層と導体回路層からなるものであり、前記基板が絶縁板の両面あるいは片面に導体層とめっき層を交互に形成したものであり、その上に絶縁樹脂液を塗布乾燥させた上で樹脂膜をパターン化し、しかるのちめっきを施すことを特徴とする請求項1記載のプリント配線板の製

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造方法を提供するものである。

【0016】また、請求項4では、前記絶縁樹脂液が感光性樹脂液であることを特徴とする請求項1、2、3何れかに記載のプリント配線板の製造方法を提供するものである。

【0017】また、請求項5では、前記流し出し式塗布がスロットコートであることを特徴とする請求項1、2、3、4何れかに記載のプリント配線板の製造方法を提供するものである。

【0018】また、請求項6では、前記流し出し式塗布がカーテンコートであることを特徴とする請求項1、2、3、4何れかに記載のプリント配線板の製造方法を提供するものである。前記流し出し式塗布がカーテンコートであることを特徴とする請求項1記載または請求項2記載のプリント配線板の製造方法を提供するものである。

【0019】特に、流体の低固形分濃度の液体としては、固形分濃度が10%以下、もしくは高固形分濃度の液体の希釈溶剤がよく、高固形分濃度の液体としては、固形分濃度が40%から80%、粘度が450から5、000CPSの液体が好ましい。

【0020】また、流体の低固形分濃度の液体としては、高固形分濃度の液体の希釈溶剤好ましい。

【0021】

【作用】本発明によれば、該低固形分濃度の液体の拡張ぬれにより基板表面に凹部がある場合でも凹部内の空気が該流体に置換され、高固形分濃度の液体に対するぬれ性が向上し、さらに下地の低固形分濃度液体の希釈溶剤揮発分が乾燥時に上層の高固形分濃度液体の層に拡散して行くことで、該高固形分濃度液体層のレベリング性を向上させ、結果として該基板表面の凹凸に関係なく平坦な塗膜形成が可能となる。

【0022】

【実施例】本発明の塗布方法について図1～図3の一実施例に従って詳細に説明する。図1及び図2は、本発明に於ける塗布方法の過程を示す。図3は、塗膜の平坦化率算出方法に用いる図を示す。図3により得られたa、b、cの値を元に、

$$\text{平坦化率 (\%)} = (\text{厚み } b / ((\text{厚み } a + \text{厚み } c) / 2)) \times 100$$

という式で平坦化率を出す。

【0023】本発明が適用される塗布装置としては、スロット（ダイ）コータ、カーテンコータ等が挙げられる。本実施例の場合、スロット（ダイ）コータを用いた。

【0024】基板は、たとえば、高さが18から35μm、幅が100μm以下の導体回路層によって形成された凹凸を有する基板であるが、これに限られない。

【0025】まず、脱脂・酸洗浄・水洗浄等を施した基板（図1-1）表面上に低固形分濃度液体（固形分濃

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度：10%以下、粘度：20cps以下）を塗布し（図1-2）、次いで完全に乾燥していない状態で高固形分濃度液体（固形分濃度：40%～80%、粘度：450～5,000cps）を塗布し（図1-3）、最後に乾燥を行って塗膜を形成する（図1-4）ものである。

【0026】〈実施例1〉脱脂・酸洗浄・水洗浄等を施\*

〔材料〕種 別：ソルダーレジスト

固形分：高固形分濃度 …… 80%（粘度：5000CPS）

低固形分濃度 …… 0%

低固形分濃度液体は、高固形分濃度液体の希釈剤（シ

クロヘキサノン：メチルセロソルブ＝1：3）を用い ※

〔基板〕種 別：プリント回路用基板

サイズ：340×340×0.6mm厚

〔塗布条件〕搬送速度：0.6～1.2m/min

塗布ヘッド／基板間距離：100～300μm

吐出圧力：0.1～3.0kg/cm<sup>2</sup>

塗布ヘッドスリット幅：30～300μm

〔乾燥条件〕乾燥温度：80℃

乾燥時間：30min

その結果、気泡の巻き込みの無い塗膜を得ることが出来た。この時の平坦化率は、～93%であった。

【0028】〈実施例2〉脱脂・酸洗浄・水洗浄等を施

した表面に凹凸を有する基板の上に、まず低固形分濃度液★

〔材料〕種 別：ソルダーレジスト

固形分：高固形分濃度 …… 80%（粘度：5000CPS）

低固形分濃度 …… 10%（粘度：10CPS）

低固形分濃度液体は、高固形分濃度液体を溶剤（シクロ

ヘキサノン：メチルセロソルブ＝1：3）で希釈したも☆

〔基板〕種 別：プリント回路用基板

サイズ：340×340×0.6mm厚

〔塗布条件〕搬送速度：0.6～1.2m/min

塗布ヘッド／基板間距離：100～300μm

吐出圧力：0.1～3.0kg/cm<sup>2</sup>

塗布ヘッドスリット幅：30～300μm

〔乾燥条件〕乾燥温度：80℃

乾燥時間：30min

その結果、気泡の巻き込みの無い塗膜を得ることが出来た。この時の平坦化率は、～96%であった。

〔材料〕種 別：ソルダーレジスト

固形分濃度：80%（粘度：5000CPS）

〔基板〕種 別：プリント回路用基板

サイズ：340×340×0.6mm厚

〔塗布条件〕搬送速度：0.6～1.2m/min

塗布ヘッド高さ：100～300μm

吐出圧力：1.0～3.0kg/cm<sup>2</sup>

塗布ヘッドスリット幅：200～300μm

〔乾燥条件〕乾燥温度：80℃

乾燥時間：30min

その結果、断面観察により基板表面の凹凸部内に気泡の巻き込みが認められた。

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\*した表面に導体回路層を形成した基板の上に、まず低固形分濃度液体を塗布し、次いで完全に乾燥していない状態で高固形分濃度液体を塗布した。以下に各条件を示す。

【0027】

【0029】

◆【0030】〈比較例1〉従来の方法により、以下の条件で塗布を行った。

【0031】

50 【発明の効果】以上の如く、本発明の塗布方法によれ

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ば、まず低固形分濃度の液体を塗布し、次いで完全乾燥前に高固形分濃度の液体を塗布するようにしたので、たとえば、凹凸を有する基板表面上に気泡を巻き込むことなく平坦な塗膜を形成することが出来る。

【0032】

【図面の簡単な説明】

【図1】本発明の塗布方法の一実施例を示す断面図である。

【図2】本発明の塗布方法の一実施例を示す基板表面微小凹凸部の拡大断面図である。

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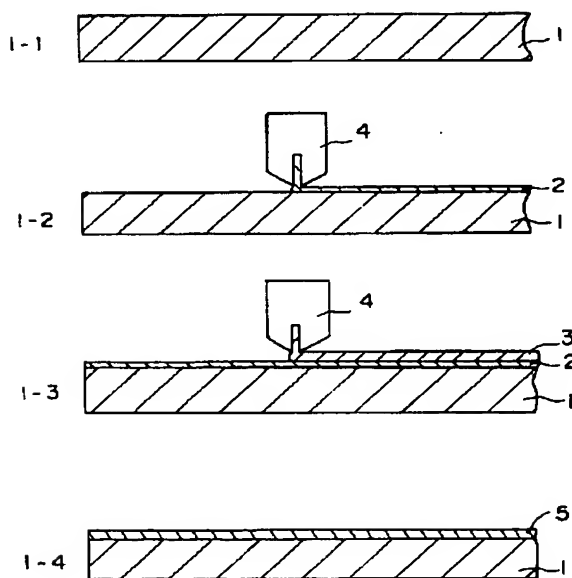
8

【図3】平坦化率の算出方法の元になるa、b、cの値を示す図である。

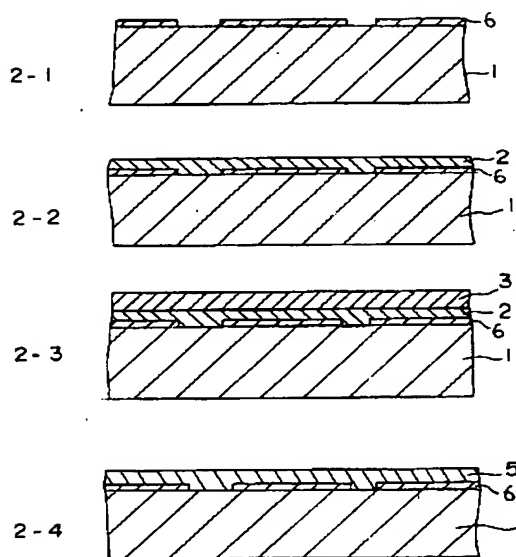
【符号の説明】

- 1 …… 基 板
- 2 …… 低固形分濃度液体
- 3 …… 高固形分濃度液体
- 4 …… コータヘッド
- 5 …… 塗膜
- 6 …… 導体回路層

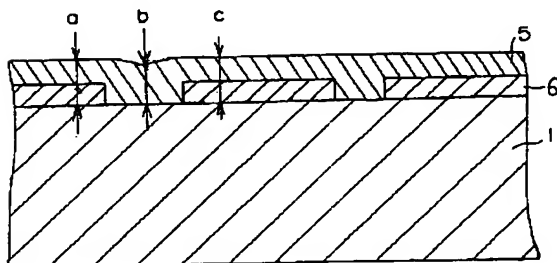
【図1】



【図2】



【図3】



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